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THE
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Himalayan Pine
Pinus excelsa Wall.

The frontispiece represents a Himalayan Pine (*Pinus excelsa* Wall.) growing in the Morris Arboretum. This handsome pine, marked by its drooping leaves, is a native of the Himalayan region west of Afghanistan. It is grown in this country as an ornamental, supposed to be hardy in sheltered situations as far north as Massachusetts (Bailey).

This tree sometimes attains a height of 150 feet, forming a broad loose open top of great beauty. The bluish-green leaves, 6 to 8 inches long, are borne in clusters of 5 in a fascicle. The cylindric gray-brown cones are from 6 to 10 inches long.

The variety *zebrina* Bailey has leaves variegated by a whitish zone. Both types are represented at the Arboretum.

The photograph was taken by Gustave Liebscher.

RODNEY H. TRUE

BARBERRIES*

—BY—

DR. L. M. AMES

U. S. Department of Agriculture

Dr. Ames outlined the history of the common barberry, *Berberis vulgaris,* and the story of its relation to the rust of grains. Native in the mountains of central and western Asia, it found its way into Italy and Spain in the seventh century, where its showy berries, supposed medicinal qualities and the dyeing properties of the inner bark and stem brought it into cultivation. It was not introduced into Northern Europe until the seventeenth century, when it was brought by early colonists to America. Here it was planted out as an ornamental shrub, yielding berries used in making jams, jellies and wine, and a yellow dye from the inner bark. It is said that the leaves were used in tea and salads, and the slender tough stems for rake handles and similar purposes. Its thorny shrubbery was useful for hedge and fence purposes.

It was not long, however, before an injury to cereals growing near the barberries began to attract attention, both in America and in Northern Europe. Laws restricting its use were passed in Connecticut, Rhode Island and Massachusetts between 1726 and 1766. Similar laws were passed in several European countries shortly after 1800. The first well-directed effort on record to demonstrate the supposed relation of the barberry to the grain disease was made by the English horticulturist, Knight, in 1804, and his results were confirmed by the German, De Bary, in 1865, who proved beyond doubt a relation to exist. The distribution of the barberry in America followed the covered wagon, and birds and other natural agencies aided the efforts of man.

The barberry came into Lackawanna and Susquehanna counties in Pennsylvania in 1737, when the Vail and Drumm families brought it from Massachusetts. It has been growing in the Cumberland Valley not less than a century. By 1916, the recognized damage to the wheat crop reached such proportions (184,000,000 bushels) that systematic efforts were soon begun to eliminate this shrub from agricultural areas, an effort that is still increasing in intensity and widening in area.

Fortunately, there are species of this valuable group that do not carry the rust disease and the common barberry can be replaced in horticultural relations by other beautiful types.

The genus, *Berberis,* contains over 500 described species, of which but two are

* Summary of lecture given January 9, 1937, at the Morris Arboretum of the University of Pennsylvania.

native to the United States: *Berberis fendleri* Gray and *B. canadensis* Mill., both susceptible to rust infection. *B. fendleri* is native in Colorado and adjacent regions. A cross with *B. canadensis,* named *B. rehderiana,* has been described. *Berberis canadensis* Schrad. is native in the general region extending from Virginia to Georgia westward to Missouri. This shrub has been quite generally distributed. *B. vulgaris* is sometimes cultivated under this name.

Many crosses of *B. vulgaris* exist, four with *B. siberica,* one with *B. veitchii,* one with *B. aristata,* one with *B. heteropoda,* three with *B. chinensis,* one with *B. canadensis,* one with *B. Thunbergii.* Many of these have received specific botanical names. In addition, there are several varieties distinguished as follows:

Berberis vulgaris var. **albo-variegata.**
Leaves margined with white.

B. v. var. **argento-marginata.**
Leaves margined with white.

B. v. var. **aureo-marginata.**
Leaves margined yellow.

Leaves deeply purple.
B. v. var. **atropurpurea.**

B. v. var. **lutea.**
Fruit bright yellow.

B. v. var. **alba** (var. **leucocarpa** K. Koch).
Fruit white or yellowish.

B. v. var. **enuclea** (var. **asperma** Willd.—var. **apyrena** Schrad.).
Fruit without seeds.

B. v. var. **dulcis.**
Fruit sweet or but slightly acid.

Many of the *vulgaris* hybrids are being grown in the Eastern and North Central States.

The best known and by far the most extensively cultivated barberry at this time is the common Japanese barberry (*Berberis thunbergii,* DC.). Several hybrids of this species are worthy of mention and of cultivation:

Berberis thunbergii var. **maximowiczii.**
Leaves usually acute and green beneath.

B. t. var. **argento-marginata.**
Leaves variegated with white.

B. t. var. **minor.**
Low, dense form.

B. t. var. **plurifolia erecta.**
Dense, upright form.

B. t. var. purpurea.
Leaves purple.

B. t. plurifolia (B. ottawensis).
Flowers umbellate to racemose.

Hybrid: **B. thunbergii x vulgaris (Berberis ottawensis).**

B. thunbergii x julianae (B. mentorensis).

The most variable of the ones mentioned above are those derived by hybridization. *B. ottawensis* has been sold extensively throughout the country. Though immune itself to rust, some of its seedlings through segregation give rise to susceptible *vulgaris* types. Some of the newer types deserve special mention:

Berberis thunbergii var. **pluriflora erecta** adds to the merits of the species an upright habit of growth making it suitable for formal hedges. It colors well in the fall, and the bright red berries cling to the bush far into cold weather.

Berberis circumserrata, a little-known type from northwestern China, is a remarkably attractive shrub, with large, yellow-red tapering fruits, borne in clusters from one to five in a long peduncled raceme. It has not yet found its way into the trade.

Berberis gilgiana, likewise from northwestern China, is one of the few pubescent types. The berries become brilliant red.

All Barberries do not have red berries, some bearing black or purplish fruit. *Berberis heteropoda* from Turkestan, introduced about 1875, has very juicy, pear-shaped fruits. *Berberis turcomanica* var. *integerrima* has smaller fruits of very marked color. The leaves have a peculiar light hue, marking it distinctly from other species.

Among the evergreen barberries, the rust-resistant *B. julianae* is characterized by stiff upright stems, bearing dark-green glossy leaves and very long spines that make it a hedge plant of great beauty, also a protective barrier against man and beast.

A brief mention was made of the related genus, *Mahonia,* from the Pacific Northwest. *Mahonia Aquifolium,* the Oregon grape, brought from the Pacific Northwest by the Lewis & Clarke Expedition, is either immune or highly resistant to the rust. The glossy, divided evergreen leaves are variable in form. The long racemes of bright yellow, fragrant flowers are followed by purplish, edible fruits.

Mahonia repens differs in being procumbent. Both are useful as ground cover under shrubs or trees, or in places not exposed to bright sunlight during freezing weather.

The Barberry family offers about 30 harmless species and varieties of beautiful shrubs that can be grown anywhere in the United States.

Reported by RODNEY H. TRUE

MAGNOLIAS*

—BY—

ARTHUR D. SLAVIN

THE GENUS *Magnolia,* named in 1715 for Dr. Pierre Magnol, director of the botanical garden at Montpellier, France, is native in the wilds of Asia, from which region many of the present horticultural forms were obtained, and in parts of North America.

Magnolias make up one of the finest groups of flowering trees and shrubs available to gardeners. The variety in form, stature, time of flowering, and in color, make the group one of great beauty and dignity.

Magnolias are not particular as to soil conditions, if an abundance of plant food is available, and if the location is well-drained. Both drought and wet feet are injurious. They need no pruning, and do best if planted where they are to remain. In transplanting, small plants with root systems well-balled and burlapped should be used.

Propagation has become a common practice in this country. Hybrids and special forms are generally grafted, although budding is also practiced. If skillfully performed, budding is the preferable method. The choice of stock is important. European practice often calls for *Magnolia liliflora,* a species tender in this country. In this region, *Magnolia tripetala* is sometimes used with uncertain results. The best stock is *Magnolia Kobus,* of the *borealis* form, producing vigorous plants with little or no trouble from suckering. Layering, producing self-rooted plants, would be the favorite method were it not so slow and were the number of plants produced at a time greater. With species seeds are still the accepted method of reproduction.

Magnolias are subject to serious attack by but one insect, a scale large enough to be readily seen by the unaided eye. These scales look like brown leather spots on branches from one to three years old. If allowed to spread, the main stems may be attacked. Miscible oil and nicotine soap solutions are most effective but should be used with great care lest the leaves and young branchlets be burned. The insect should be sought from the first of June until September. If it appears, all infected parts should be scrubbed off with a toothbrush or other soft scrubbing implement, using a weak solution of soap chips.

The floral succession of Magnolias begins with the star Magnolia, *Magnolia stellata,* from Japan. Flowers appear before the leaves, opening a multitude of white, star-like flowers, over three inches in diameter, in the latter part of April. This

* Summary of lecture given at the Morris Arboretum, February 13, 1937.

species may reach the size of a small tree and is hardy throughout the country. Equally, if not more important, is the form *rosea,* having pinkish petals.

As this species passes its best, the pure white flowers of the Anise Magnolia, *Magnolia salicifolia,* appear. The fragrance of the crushed leaves gives it the common specific name; the willow shape of the leaves gives it the Latin specific name. It is a small tree that may reach a height of 20 feet, having a rather narrow habit of growth.

Magnolia Kobus blooms at the same time as the Anise Magnolia. One form, shrubby in habit, comes from Hindo in Japan; the other, more tree-like, known as the variety *borealis,* comes from Hokkaido and North Hondo. The smaller type flowers while young, the taller type only after it reaches a height of almost 15 feet. How tall it may become is not known, since it has been in cultivation here only 40 years and has never in that time stopped growing. It has a broad top, branching from near the base, with a short stocky trunk and smooth, dark-grey bark. The flowers are white, often more than five inches in diameter.

The rich purples of garden forms are derived entirely from hybrids of the Chinese *Magnolia liliflora.* It does well at Rochester, New York, in sheltered locations, but is not hardy unless judiciously planted. The species, unlike most of its hybrids, remains a broad shrub, 8 to 12 feet in height, with delicate, vase-shaped purple flowers appearing during the first week in May. The form *nigra* has larger flowers, with petals deep purple on the outer side, pale lavender within. It blooms more prolifically than the type, is larger, and is entirely hardy.

Magnolia denudata, the Yulan magnolia, blooms shortly before the purple type just described. During the first days of May, the large, bowl-shaped, creamy-white flowers crown every branch and spread a fine aroma. Full-grown specimens are broad, sometimes occupying an area 50 feet in diameter. It is best planted as a specimen tree in a spacious lawn. A beautiful rose-red form, found in China by Wilson in 1901, is not to the speaker's knowledge in cultivation in this country.

Magnolia soulangeana, a cross between *Magnolia liliflora* and *Magnolia denudata,* in its many forms offers a profusion of bloom and of color, from the time of the appearance of flowers on *Magnolia Kobus* until the Yulan magnolia blooms. This cross is one of the earliest important plants produced by artificial crossing. The Yulan magnolia, fertilized by pollen from *Magnolia liliflora,* produced its first flowers in 1826. It was a true intermediate type. Innumerable crosses have since been made with a wide range of colors, from almost pure white to dark purple. The character of the original hybrid cannot be definitely known. Variations in this wide group chiefly concern color, size of flower, and time of flowering. *Alba* blooms first, succeeded by *Norbertiana, Andre Le Roy, Verbanica, Brozzonii* and *speciosa. Lennei* is the best of the deep purple types.

The remaining members of the family produce their flowers after the leaves have appeared.

The large native tree, *Magnolia acuminata,* the cucumber tree of the Eastern States, blooms in the last week of May. This species is most valued for its size, form and foliage. It reaches a height of 60 to 80 feet. The brilliant scarlet seeds, dangling from the pickle-like fruit, gives this species a special interest.

Magnolia Fraseri, from the Southern States, has leaves often 18 inches long, broad at the apex, narrowed at the base to an earlike lobe on each side of the leaf-stalk. The flowers are creamy white, fragrant, from 10 to 12 inches across. The average size of cultivated specimens is from 20 to 30 feet.

Magnolia obovata, from Japan, having large, obtusely-pointed leaves and pure white flowers, although hardy in Rochester, New York, is not likely to reach the size seen in the wild state in Japan, 90 feet.

Magnolia tripetala, the umbrella tree, native from Southern Pennsylvania to the Gulf, is a medium-sized tree with large leaves and white, good-sized flowers that give off a sickish, sweet aroma.

Magnolia macrophylla, of the Southern States, bears the *largest* leaves of any tree capable of cultivation in the North. Sometimes a length of 30 inches is attained. The flowers, although somewhat hidden by the leaves, may reach a diameter of 12 inches. It flowers early in June.

Some of the most beautiful flowers seen among the Magnolias are found in the late-blooming types, which open after the spring riot of color is over. Unsurpassed for beauty by rose, rhododendron or peony, *Magnolia parviflora,* the tulip magnolia, is most valuable. Large, tulip-shaped flowers dot the plant with pure white blooms, having brilliant, crimson-colored centers made up of stamens. Seldom more than 10 feet high, this species is not only among the best flower-producers in June, but one or two blooms can be found on a healthy plant throughout the summer. It is usually grown as a specimen plant.

Magnolia Watsonii has practically disappeared from cultivation in this country, although formerly found here. It is to be seen in England as a tree-like shrub about 14 feet tall. The fragrant flowers are similar to those of *Magnolia parviflora,* but at times reach a diameter of five inches, with thick petals in saucer-shaped arrangement around a red center.

Magnolia Wilsonii, a comparatively late introduction by Dr. Wilson, has not yet had time enough to be well-known.

The smallest member of this family, *Magnolia virginiana,* the sweet bay of our wet lands, is a shrub about eight feet tall in the North, although a small evergreen

tree in the South. The fragrant, creamy-white flowers open early in June. The leaves are glossy on the upper side and distinctly grayish underneath.

One species, *Magnolia grandiflora,* is a broad-leaved evergreen in the South, where it reaches the size of a large forest tree, having large, lustrous dark foliage. Its growth habit is pyramidal. It is grown successfully as far north as Philadelphia, and is much in evidence in Washington as a tree reaching a height of about 30 feet. Large, fragrant white flowers appear in June, but the blooming period is somewhat dependent on climatic conditions. Flowers may be seen from May until August.

Summarized by RODNEY H. TRUE

THE BARBERRIES AT THE ARBORETUM

—BY—

JOHN C. SWARTLEY

A FAIRLY LARGE collection of these spiny, but intensely interesting shrubs, was established here while Mr. John T. Morris was still living. This collection can be found directly north of the Pond, on the hillside leading up to the Mansion. Some types, either slow-growing or tender, appear like infants, while others range in size to the master of them all—a *vulgaris* hybrid about ten feet tall, with nearly a fifteen-foot spread and branches borne to the ground with bunches of heavy fruit.

The exact date of this first planting is uncertain, for few records have come to light, but we are reasonably sure that we have here between 30 and 35 shrubs that came from the Arnold Arboretum nearly thirty years ago. These represent at least 20 different species, varieties and hybrids, not all of which have been determined at the present writing.

There are several worthy of note. The evergreen varieties include *Berberis ilicifolia* (10), richly colored, at the top of the group; *Berberis Gagnepainii* (8), a straggly shrub on the side toward the formal garden; *Mahonia Aquifolium* (1) a fine specimen in the center; *Berberis Julianae* (12), farther toward the Pond, entirely unharmed by cold until last winter and still a very decent shrub, and *Mahonia Bealii* (2), which has been almost vanquished by the severity of recent winters. Deciduous species include *Berberis amurensis japonica* (22) with large leaves and extremely red fruits, *Berberis Sieboldii* (49) with a somewhat straggly form, but graced with interesting leaves and many red fruits; *Berberis ottawensis* (72) a hybrid between *Berberis Thunbergii* and *Berberis vulgaris,* which is a medium-sized shrub distinguished by many panicles of fruit and spreading, vase-shaped form; *Berberis vulgaris* (60) in many beautiful forms, including one with yellowish fruit, and *Berberis*

(Numbers refer to check-list of species and varieties at end of article.)

provincialis (71), a hybrid between *Berberis vulgaris* and supposedly *Berberis sibirica*. These range from small, shiny-leaved forms to large, coarse-leaved ones, very similar to *Berberis vulgaris*, giving a good illustration of the range from one parent to the other.

The second large group of Barberries is located below the cottage along Germantown Avenue. These number between 45 and 48 individuals, with about 25 different species, varieties and hybrids. Most of them came from the Arnold Arboretum on November 6, 1912, with some from the Bureau of Plant Industry. Nearly all were marked only with numbers, and of these many have been lost or mixed, although a few can be traced directly to collections in China by E. H. Wilson. According to a list in our possession, 20 different numbers, comprising about 17 different species and varieties, were sent to Mr. John T. Morris on the above date.

In this group one finds a great variation in form, coloration of berries and leaves, the berries of some starting to color only a few weeks after the flowers disappear. In the fall there is a wonderful display of contrasting shades of red and green, with some shrubs gracefully spreading and others straggly or vase-shaped, but redeemed by the brilliant colors of their numerous fruits.

Here we find *Berberis Dielsiana* (36), with dull green leaves interspersed with clusters of bright red berries and gracefully arching branches; *Berberis dasystachya* (32) with branches more upright, but with many bloomy bluish fruits; *Berberis Gilgiana* (40), one of our rust-resistant varieties, giving a characteristic effect with its slender dark twigs, entire reddish leaves and berries just turning from green to light red; *Berberis Poiretii* (47), a closely-branched shrub, upright, but with a graceful, widespreading top, small bright-green leaves and fruit of very lustrous red; *Berberis diaphana* (33), compact and daintily-leaved; *Berberis Vernae* (58) with many slender drooping branches, and green to light-red berries hanging in chains; *Berberis Wilsonae* (64) formerly a beautiful, widespreading, compact form with small leaves, but now reduced by severe weather; *Berberis aggregata* (19), which is similar to *Berberis Wilsonae*, but has slightly larger leathery leaves, and at the bottom of the group, the most notable of them all—*Berberis circumserrata* (28)—another rust-resistant variety, heavily branched, but fairly low and compact in habit, holding its large red leaves and yellowish-red berries until late in the winter.

Our collection of Barberries has grown considerably since 1932. In the early spring of 1933, some numbers of Barberries collected in the Rock Expedition of 1932 to Tibet were sown, and several different kinds germinated. We have not yet received the determinations for the Barberries, but among our seedlings we have recognized another rust-resistant variety—*Berberis dictyophylla albicaulis* (36)—a striking shrub with whitish wooly branches. According to the Arnold Arboretum Bulletin of Popular Information, issued October 1, 1936, this variety is immune.

In the spring of 1934, and again in 1935, seeds of various species were obtained from different botanical gardens. These include two interesting forms, namely, *Mahonia repens* (5), which really seems to be dwarf, and *Berberis Thunbergii minor* (54), which has come true from seed. Both are immune. This past fall seeds of a few more were collected at Bell Station, Maryland, where one of the Government testing grounds is located. Among them is *Berberis koreana* Palibin, another immune species, which we hope to germinate this year.

Check-List of Barberries at the Morris Arboretum.

Those starred are large, established plants. The rest are seedlings or cuttings of various sizes. In each case the native habitat is given: C—China, N. C. C.—North Central China, etc.

MAHONIA GROUP

* 1. **Mahonia Aquifolium,** Nutt.—Brit. Col. to Ore.
2. **Mahonia Bealii,** Carr.—C.
* 3. **Mahonia Fremontii,** Fedde.—West Texas.
4. **Mahonia nervosa,** Nutt.—Brit. Col. to Calif. & Ore.
5. **Mahonia repens,** G. Don.—Brit. Col. to New Mex. & Calif.

EVERGREEN SPECIES

6. **Berberis candidula,** Schneid.—C. C.
7. **Berberis chitria,** Lind.—Himal. (semi-evergreen).
* 8. **Berberis Gagnepainii,** Schneid.—W. C.
9. **Berberis Hookeri,** Lem.—Himal.
*10. **Berberis ilicifolia,** Forst.—S. Chile.
11. **Berberis insignis,** Hook.—Sikk.—Himal. (hardy only in cold frame).
*12. **Berberis Julianae,** Schneid.—C. C.
13. **Berberis Sargentiana,** Schneid.—C. C.
14. **Berberis Soulieana,** Schneid.—C. C.
15. **Berberis triacanthophora,** Fedde.—C. C.
16. **Berberis Veitchii,** Schneid.—C. C.
17. **Berberis verruculosa,** Hemsl. & Wils.—W. C.
18. **Berberis aetnensis,** Presl.—Cors. & Sard.

DECIDUOUS SPECIES AND VARIETIES

*19. **Berberis aggregata,** Schneid.—W. C.
*20. **Berberis aggregata, Prattii,** Schneid.—W. C.
*21. **Berberis amurensis,** Rupr.—N. E. Asia.
*22. **Berberis amurensis japonica,** Rehd.—Japan, Korea.
23. **Berberis angulosa,** Wall.—Himal.
24. **Berberis Beaniana,** Schneid.—W. C.
25. **Berberis Boschanii,** Schneid.—W. C.
26. **Berberis canadensis,** Mill.—Virg. to Ga. & Miss.
27. **Berberis chinensis,** Poir.—Caucas.
*28. **Berberis circumserrata,** Schneid.—N. W. C.
29. **Berberis concinna,** Hook.—Sikk.—Himal.

30. **Berberis crataegina,** D. C.—Greece.
31. **Berberis cretica,** L.—Greece.
*32. **Berberis dasystachya,** Maxim.—C. & N. C.
*33. **Berberis diaphana,** Maxim.—W. C.
34. **Berberis dictyoneura,** Schneid.—W. C.
35. **Berberis dictyophylla (Franch.) albicaulis.**
*36. **Berberis Dielsiana,** Fedde.—W. C.
37. **Berberis Edgeworthiana,** Schneid.
38. **Berberis Faxoniana,** Schneid.—W. C.
39. **Berberis Francisci-Ferdinandi,** Schneid.—W. C.
*40. **Berberis Gilgiana,** Fedde.—N. C. C.

DECIDUOUS SPECIES AND VARIETIES

41. **Berberis Giraldii,** Hesse.—N. C. C.
42. **Berberis Lecomtei,** Schneid.—W. C.
43. **Berberis Leichtlinii,** Schneid.—C.
44. **Berberis Mouillacana,** Schneid.—W. C.
*45. **Berberis nummularia (Bge.) pyrocarpa,** Schneid.—Turkest. & N. Persia.
46. **Berberis parvifolia,** Sprague—W. C.
*47. **Berberis Poiretti,** Schneid.—N. C.
48. **Berberis polyantha,** Hemsl.—W. C.
*49. **Berberis Sieboldii,** Miq.—Jap.
50. **Berberis Silva-Taroucana,** Schneid.—W. C.
51. **Berberis thibetica,** Schneid.—W. C.
52. **Berberis Thunbergii,** D. C.—Jap.
53. **Berberis Thunbergii Maximowiczii,** Reg.
54. **Berberis Thunbergii minor,** Rehd.
55. **Berberis Tischleri,** Schneid.—W. C.
*56. **Berberis turcomannica (Karelin.) integerrima,** Schneid.—Turkest. & N. Persia.
57. **Berberis yunnanensis,** Franch.—W. C.
58. **Berberis Vernae,** Schneid.—N. W. C.
*59. **Berberis virescens,** Hook.—Sikk.—Himal.
*60. **Berberis vulgaris,** L.—Eur.
*61. **Berberis vulgaris atropurpurea,** Reg.
*62. **Berberis vulgaris lutea,** L'Her.
*63. **Berberis vulgaris, sulcata.**
*64. **Berberis Wilsonae,** Hemsl. & Wils.—W. C.
*65. **Berberis Wilsonae Stapfiana,** Schneid.—W. C.
*66. **Berberis Wilsonae subcaulialata,** Schneid.—W. C.
67. **Berberis xanthoxylon,** Hassk.—Java.

HYBRIDS

68. **Berberis declinata,** Schrad.—**vulgaris x canadensis.**
69. **Berberis laxiflora,** Schrad.—**vulgaris x chinensis?**
70. **Berberis macracantha,** Schrad.—**vulgaris x aristata.**
*71. **Berberis provincialis,** Schrad.—**vulgaris x sibirica?**
*72. **Berberis ottawensis,** Schneid.—**vulgaris x Thunbergii.**
73. **Berberis Spaethii,** Schneid.—**chitria? x ?**

FURTHER NOTES ON THE DISEASE OF HIMALAYAN PINES

—BY—

JOHN AUSTIN JUMP

CONSIDERABLE ATTENTION was attracted during 1934, in Pennsylvania and New Jersey, by the widespread dying and injury of the Himalayan pine *(Pinus excelsa)*. Speciman trees died on several estates in the vicinity of Chestnut Hill, among which was the rare *Pinus excelsa* var. *zebrina,* a variety with variegated needles that grew at the Morris Arboretum.

The winter of 1933-34 was characterized by record-breaking low temperatures, and many plants which were not strictly hardy in the latitude of Philadelphia either died or were severely injured. In some cases this was a direct effect of the low temperatures, but the writer believes that in the case of the Himalayan pine the low temperature was damaging primarily because it created conditions favorable to the entrance of fungi.

Prof. H. H. York, pathologist on the Arboretum staff, delivered a lecture at the Arboretum in February, 1936, on the subject of winter injury (Arboretum Bulletin Vol. I, No. 3). He emphasized the point that winter injury was not the sole cause of the death of these pines, and referred to a study of the fungi associated with the cankers which was being made by the writer.

The fungus which was found to be associated consistently with cankers on the pines was *Sphaeropsis malorum,* which is well known as the cause of a serious fruit rot, canker, and leaf spot of apple. Cultures of this fungus were obtained from the diseased trees, and inoculations were made from them on species of two, three and five needle pines and also upon young apple trees. The two and three needle pines, or "hard" pines, which were inoculated did not show signs of infection, but several of the three year old white pines were killed and a resinous canker formed on others. One of the apple trees was completely killed within three months by the canker resulting from the inoculation. These inoculations were made in small wounds produced by scraping the bark of the tree with a needle.

A study was made of the annual rings of growth in polished sections of wood taken from dead Himalayan pines. Old cankers which had subsequently callused over were noted, and their year of origin was determined by counting the rings. When these data were compared with weather records it was found that the cankers

originated in winters of unusually low temperatures. Apparently they were the result of fungus infections in cracks or lesions in the bark caused by low temperatures.

The Himalayan pine should not be considered to be unreliably hardy in this latitude. The writer observed several mature specimens in excellent health at Rochester, N. Y., during the summer of 1936. Given favorable conditions of soil and exposure, and with reasonable care taken to remove any cankers that may appear, this species of pine should continue to be a valuable ornamental subject.

Sphaeropsis malorum should not be regarded as a serious primary parasite of Himalayan pine, but rather as a wound parasite which may become very serious in weakened trees. Local abundance of apple trees, which are the primary host of this organism, might account for its prevalence in this area.

Botanical Department
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PLANT PATHOLOGICAL
LABORATORY

THE HERBARIUM OF THE MORRIS ARBORETUM

—*BY*—

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THE visitor who penetrates to the second floor of the Administration Building of the Morris Arboretum will find there a large room lined with tall metal cases. A glance into one of these cases will reveal pigeon holes filled with large sheets of white paper to which are affixed dried and pressed specimens of plants. In a word, the visitor has entered the Herbarium.

There are some to whom a collection of dead and flattened plants seems nothing more than just so many mummies. They will see here only the lifeless remains of a world of vegetation and will turn away with indifference, if not contempt, from what they consider to be merely a botanical graveyard.

To the botanist, however, such a collection serves as a fascinating and indispensable aid in his studies of plant relationships and plant distribution. The well organized herbarium represents a veritable treasury of fact and information. Not only is each specimen accompanied by a label giving data of great interest and value, but thanks to modern methods of collecting and pressing plants, the specimens themselves are remarkably lifelike.

Probably everyone has had the experience of attempting to press and dry some flower that interested him—perhaps a rose, a violet or a spray of forget-me-not. Discouraged by the dismal results invariably procured from placing a specimen between sheets of note paper or the pages of a book, the disillusioned collector has doubtedless forsworn all further experiments of this nature and has concluded that of all forlorn and unrealistic objects none can surpass a dried plant!

Today, however, the botanist who wishes to preserve plants for study utilizes a vastly superior technique. By using large sheets of absorptive paper, corrugated ventilators and cotton pads, aided frequently by artificial heat to hasten drying, it is possible to prepare specimens which have lost little, if any, of their original color and which retain to a high degree the character and appearance of the living plant. Space will not permit even the mention of the various improved and refined methods which enable us to convert a twig with a spray of flowers into permanent form with no essential sacrifice of its inherent aspect.

Surrounded by a collection such as this the student finds himself in a kind of two-dimensional botanical garden where for twelve months of the year, regardless of rain or drought, snow or ice, he may study the flora of any part of the world and compare the characters of closely related species with a view to determining their identities and affinities. In this way alone can the specimens collected by expeditions to remote places be critically and leisurely examined and species new to science detected. Thus, and thus only, can the botanist of today study the plants which grew in a given area a generation or a century ago—an area in which man or nature has frequently destroyed or profoundly modified the original flora.

The material in the cases at Chestnut Hill represents chiefly specimens of woody plants (trees and shrubs); the only herbaceous forms included are those which have a definite place as ornamentals in cultivation, such as foxgloves, bell-flowers, phloxes, asters and the like. In this way duplication with the main herbarium in the Department of Botany is avoided.

The ligneous plants in the Arboretum Herbarium have originated from two sources. First, there are the specimens made from trees and shrubs growing in the grounds of the Morris Arboretum or in other arboreta throughout the world. Then, there is that larger series representing the native woody floras of the various continents. This arrangement affords, among other advantages, an opportunity for comparing the development of a given species in cultivation with its behavior under natural conditions.

Every shrub and tree found in the Arboretum is represented in the herbarium by at least three specimens; one sheet, collected during the dormant season, shows

the all-important winter buds and leaf scars; a second collection, made usually at time of blooming, displays the flowers; a third or summer specimen exhibits the foliage and often the fruit and seed as well, although to secure the latter two stages a fourth collection is often necessary. The purpose of such a series is, of course, to demonstrate seasonal variation within each species as well as to supply a representative cross section of the complete life-history.

The great bulk of the material in the herbarium, however, has been collected from natural habitats in various parts of the world. This series is naturally strongest in plants from eastern North America, but every continent is represented. Eastern Asia has long been one of the important sources of cultivated plants. This is abundantly shown by the trees found growing in the Arboretum, and the herbarium is correspondingly rich in material from this part of the world. Among the most important series of dried plants acquired for the herbarium were the collection of R. R. Stewart from Kashmir (numbering over 1200 sheets) and a set of nearly 3000 specimens collected by J. F. Rock on his last expedition to China. As neither of these two exsiccatae is represented in any other institution in or near Philadelphia, the function of the Arboretum as a center for the study of Asiatic plants is obvious.

During the three and a half years that this herbarium has been in existence the number of plants has been increased by purchase, by exchange and by the field activities of the members of its staff until the collection now includes approximately 17,000 sheets. And yet this must be regarded as merely a good beginning. In order adequately to fulfill its avowed function a working collection should contain for each individual species sufficient specimens to demonstrate its natural range of distribution. Not until the student has before him such a series can he understand fully the significance of local variations, not until then can reliable range maps, showing the natural occurrence of each tree and shrub, be compiled. The ideal situation, requiring perhaps many years for its realization, would be to have for every woody plant—at least in the United States—a specimen from every *county* in which it grows. If then, in addition to the specimen itself, the accompanying label might convey such information as the exact locality and date of its collection, the type of soil in which it grew, the nature of its surrounding vegetation and many another pertinent and often ephemeral fact, we should in truth come to look upon the modern herbarium as an inexhaustible storehouse wherein are contained the answers to a multitude of questions.

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CORRECTION

In Vol. I, No. 6, page 77, second line from the bottom of the page
Tsuga cuspidata nana should be **Taxus cuspidata nana.**